

a PASS

Problem Accepted - Solution Supplied

2022
WINNER



2022 Winner - Pump Sump Claw
Matt Holz, TasWater



An award providing opportunity for water industry operational staff to share their in the field innovations & fixes to problems so that others in the water industry can benefit.



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Previous Winners

2021	Craig Woodhouse , TasWater
2020	Scott Kitwood - Gippsland Water
2019	Toby Spark - Gippsland Water
2018	Michael Cartmer, Quinton Caird, Martin Zardins, Stephen Casey & Michael Dixon - Power & Water
2017	Marcus Boyd - Toowoomba Regional Council
2016	Daren Lord - TasWater
2015	Frank Rinaldo - North East Water
2014	Lester Little - TasWater
2013	Terry Randall & Danny Roberts - Port Macquarie Hastings Council
2012	Mark Walker - Gippsland Water
2011	Wayne Shaw - Gippsland Water

Objectives of the Award

- To create an opportunity which encourages water industry operational staff to share their in-the-field innovations and/or fixes to problems so that others in the water industry can benefit.
- To provide an application process which is easy to complete and utilises a standard template. This will give all water industry operational staff the same opportunity for presenting their innovation.
- To provide the opportunity for operational staff to receive recognition for their innovation and efforts.
- To encourage operational staff to become aware of and involved with the Water Industry Operators Association of Australia (WIOA).
- To allow WIOA to share the good ideas and innovations with other Members through the Operator magazine and/or other publications.

The Process

The PASS application template and more details on the Award can be found on the WIOA website [www://wioa.org.au/awards/national-awards/pass-award/](http://wioa.org.au/awards/national-awards/pass-award/) or from the WIOA office.

Judging

All PASS applications received in the 12 month period ending 1st March annually, will be assessed by an independent panel on a number of criteria, including:

- Commonality of the problem
- Benefit to OH&S, water quality, and the environment
- Financial and sustainability benefits
- Application to other industries
- Uniqueness, adaptability and simplicity

Reward

The person who submits the PASS application deemed best in that particular year will be announced the winner of the PASS Award at the WIOA NSW Conference. Aqualift will provide sponsorship of \$2,500 for the winner to join the WIOA team on their annual operational tour of New Zealand including attendance at the New Zealand WIOG operations conference.



Pump Sump Claw

Matt Holz, TasWater

THE PROBLEM

What was the problem that you experienced?

Manual removal of rag from sewage pump stations using rakes in combination with a jet hose to cut up the rag was a very slow, physically demanding and high risk activity which would often result in rag and debris being transferred to the treatment plant and potentially cause problems there.

Removal of rag was very slow hard work with significant risk needing to be managed because operators often had to reach over railing to access rag under edges of the sump. It relied on physical effort to drag rag from pump and snag points often several meters into a sump. Rakes only allowed capture of debris down to a limited size and made lifting large rag balls almost impossible. Large rag balls had to be gradually pulled apart resulting in many lost pieces and frustratingly slow progress.

How did the problem impact you or your work situation?

Manual handling risks including soft tissue injuries due to using the rake.

A rake is not an effective tool as it cuts through rag which then falls apart. This resulted in a very tedious and extended period of physical activity leaning over rails pulling on the long shaft of the rake. The process often resulted in many smaller rags that were difficult to capture or were sucked through to other equipment or filters.

How long had the problem been occurring?

Rags balls and ragging have been increasing with the increased use of wipes. While there have been some iterations to rakes, they have generally been the standard tool for many years.



Manual removal of rag from sewage pump stations.

THE SOLUTION

How did you come up with the solution?

Matt Holz and Vere Story started investigating better ways of working. They looked at a range of options to grab the rag and lift it mechanically. They drew initial designs on paper and discussed it with coordinators and managers. Their manager, Brendan Hannigan, discussed the idea with the TasWater Innovation Team and linked in Vere and Matt to take action on it.

The Innovation Team undertook an assessment and then worked with a manufacturer to create a prototype. The first prototype was reviewed by Matt and Vere together with the Safety Officer, Greg Slore. A revised design included a better clamping action on the jaws and a bigger volume. It was important that the volume did not become too large limiting access to tight spaces and creating too heavy a lift. The safety team reviewed the design, undertook necessary checks and issued directives on use before the first trial. The second prototype was trialled with further modifications of the scissor action provided by the Safety Officer.

Who helped work on the solution?

- Vere Story - Operator
- Brendan Hannigan - Manager
- David Holmes - Innovation Team Lead
- Greg Slore - Safety Officer



“The Claw” in action.

Describe the solution.

The Claw. The claw has clamps that grab the rag without cutting or breaking it, and as the claw is lifted up, the scissor action causes the clamp to grab tighter as the weight is taken up. This way, the rag is lifted as a large wad. The claw can be operated on the lift arm of service utes or larger trucks.

One operator holds a rope that opens the jaws - a later design has a holding mechanism that can be pulled to releases the jaws to close rather than the operator holding them open. The jaws also enable the collection of smaller debris and gravel that was impossible to capture previously. The original rake or a pole can be used to push the claw under ledges and position it on a rag ball. Rag that is torn off very large rag balls is captured and held fast in the jaws, unlike with the rake.

The claw has also been very effective at grabbing tree roots which are hard to hold fast and pull out.

How has it helped you at work?

Operators don't have to enter the pump well or use a rake to remove rag. This eliminates risks associated with confined space entry and manual handling. It is much quicker and much less physically demanding than the rake. Less rag is dislodged and sucked back into pumps or lost on filters. Gravel and other debris that may arise in combined sewer /stormwater systems can be captured. Roots can be held firmly and pulled out or cut with the action of the jaws.

Suggest improvements, if time or financial limitations were not a factor.

Smaller and larger versions would be useful for different situations. As noted above there is a recent addition that holds the jaws open until they need to be deployed.

Any other comments.

Care needs to be taken to clearly see what is captured in the jaws, particularly where there are potentially cables or other features in the sump. The claw can be released if an unintended item is captured.

Filter Media Core Sample Tool

John deBoer, Melbourne Water

THE PROBLEM

What was the problem that you experienced?

During recent filter inspections at the Winneke treatment Plant, the need arose to extract media samples for analysis from various levels within the media bed. This meant that samples were to be extracted from a depth of up to 1 metre from the sand media.

Previous media sampling has often required the use of shoring to ensure the excavation would not collapse during the sampling. This could often mean the removal of up to 1m³ of media to ensure the appropriate sample could be taken.

How did the problem impact you or your work situation?

The previous method relied on using a shovel to dig down to the appropriate depth. This was a very onerous task as the area excavated needed to be quite large to ensure the media did not collapse into the excavation and that the sample taken was indeed representative of the particular level within the media. This required a high level of patience and perseverance from our operations team as there was the potential to extract samples from at least six different locations within each of the 16 media filters at the Winneke plant.

How long had the problem been occurring?

The Winneke Plant has been in operation since 1980, so any previous media sample extraction over the past 42 years has required the use of a shovel to dig down to the appropriate depth.



THE SOLUTION

How did you come up with the solution?

After taking the first few samples by shovel and experiencing our excavation collapse in on itself before we could extract the sample, the team knew it was time to come up with an easier solution. This idea came about after a short brainstorming session whilst undertaking sampling from Filter no 2 at Winneke

Who helped work on the solution?

All the Winneke Operations team assisted with the development and trial of the tool, with particular input and support from operators Yong Tee Goh, Greta Pullen and Alan Abbott.

Describe the solution.

The media extraction tool is quite simple and consists of a 1 metre section of 90mm PVC pipe with a cutting edge on one end and a separate 1 metre long auger which fits neatly inside the PVC pipe. The PVC pipe is first twisted down into the media until the supporting gravel layer is reached. The auger is then placed inside the PVC pipe and twisted down into the media to the required sample depth. The auger can then simply be lifted out of the pipe to extract the media sample. Once the sample is extracted, The PVC pipe can be removed and the hole backfilled.

The overall length of the tool is also limited to ensure it cannot be screwed in too far, to prevent potential damage to the filter nozzles.



How has it helped you at work?

This tool has made media sampling a simple, one person task with each sample taking no more than a few minutes to extract with very little physical effort required.

Suggest improvements, if time or financial limitations were not a factor.

In the future I would like to experiment with a smaller diameter version of this tool to allow smaller volume samples to be extracted which should simplify this process even further.

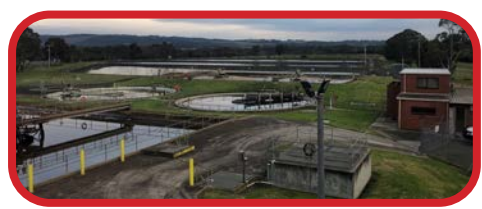
Any other comments.

I would like to acknowledge the support and assistance of the Winneke Operations team with the development and trial of this prototype tool.



Clarifier Cleaning Sprays

Scott Kitwood, Gippsland Water



THE PROBLEM

What was the problem that you experienced?

Morwell Waste Water Treatment Plant is an activated sludge plant with two treatment streams consisting of two activated sludge reactors connected to two secondary clarifiers running in parallel.

One of the main operational challenges is the routine cleaning of solids build up on the 'V' notch weirs and in the outlet channel of the clarifiers. This process is particularly time consuming as well as using lots of potable water and/or manual handling. During low seasonal flow, the weir overflow rate can be as little as <math><2\text{L/s}</math> over a clarifier circumference of about 51 metres. This low flow allowed any suspended solids to build up in the grooves of the concrete and provided an environment for algae to grow easily. If the regular site operator is on leave, the cleaning process might not be completed as regularly due to the relief operator managing more than one site.

Historically, brushes were mounted to the scraper bridge to clean the top and side walls, with a brush mounted sled being dragged in the outlet channel. This method was never truly effective due to the imperfections in the concrete, and at times also caused their own issues. If there was a surge in flow during a wet weather event, the sled would sometimes get stuck in the outlet of the clarifier, 'fault out' the scraper causing it to stop working and require a call out.

How did the problem impact you or your work situation?

The solids build-up on the weirs and outlet channel, as well as looking unpleasant, would eventually slough off in large clumps and block the clarifier outlet filter basket. These large clumps would also have the opportunity to be carried through to the UV system and reduce the effectiveness of the disinfection process.

Depending on the amount of build-up, the cleaning required could range from a hose down with potable water to, entering the outlet channel and manually scrubbing it out. A pressure wash is conducted several times a year to increase the time in-between cleans and reduce the need for a manual clean. Even the hose down takes a couple of hours for the operator to complete, cleaning both clarifiers, cleaning brushes and filter baskets, which requires bypassing treated effluent to the storage lagoons for a couple of hours. Manual handling strains to some operators are a constant occurrence and the time required to complete the cleaning process takes the operator away from valuable plant operations.

How long had the problem been occurring?

The brushes have been modified many times over the years with varying degrees of success, and the cleaning process for the clarifiers was a standard procedure conducted at a number of sites across the business. If an operator not familiar with the site attempted the cleaning process, it would more often than not create issues downstream in the UV disinfection tank.



Clarifier outlet filter baskets and UV system blocked up by solids build

THE SOLUTION

How did you come up with the solution?

Initially, efforts concentrated on improving the existing brush system to make it more effective and reliable. Although the improved brushes and adjustments cleaned the walls better, this just increased the brush wear and cleaning requirements for the brushes, and therefore didn't really make much of an improvement.

The next concept was to fabricate a spray system, which would be mounted to the scraper arm and clean the walls as it rotated around the clarifier. A pump was installed to draw the supernatant from the surface of the clarifier which would otherwise just be going over the weir anyway. This provided high-pressure cleaning and eliminated the need to use potable water. Through trial and error and in consulting with the workgroup, we came up with the current design.

Who helped work on the solution?

The idea along with its potential benefits was presented to my team leaders, and with some consultation was allocated a budget of \$5000 to complete the project. I sought assistance from multiple electricians to solve the issue that arose with the existing electrical power supply to the clarifier and the limitations on which pump I could use. Working with my fitter Jake, we put together our ideas and created a prototype. Multiple improvements have been made to optimise the spray system through trials and consulting with other operators within our team.



Spray system and clean clarifier outlet channel

Describe the solution.

The solution was a spray system that is efficient and requires little routine maintenance. The pump is mounted under the walkway of the clarifier scraper bridge. This allows for all the pipework and cables to be run out of the way whilst still allowing access to the spray system while the scraper bridge is still running. The hose from the pump to the spray manifold has a camlock fitting and all sections of the manifold are screw fit allowing for easy removal for cleaning or maintenance. An inline filter prevents any solids picked up by the pump from blocking the spray nozzles and can easily be accessed for cleaning.

The spray system has been set up on an individual circuit breaker with built in timer, this allows for the system to be turned off separate to the scraper, and also allows for the operator to select on and off times to optimise and reduce power usage when not required. All items are off the shelf and can easily be replaced for same day repair.

How has it helped you at work?

With the spray system up and running, cleaning by the operator is almost no longer required. Routine visual inspections are carried out daily, and the filter is checked/cleaned twice a week. This has reduced the time spent cleaning per week from 3-5 hour down to just 20 minutes. With more time spared for other plant related tasks and less manual strain on the operator, the reduction in operator hours for cleaning alone has covered the full cost of the project in less than 1 year.

No longer needing to bypass treated effluent, prevents around 300kL a week being sent to the storage lagoons which would take around a day to return back to be reprocessed. With the reduced flow being bypassed to the storage lagoons, the yearly lagoon pump energy consumption and run hours have dropped by 39%. Chemical usage has reduced by a combined average of around 100L per week over the year and potable water use for carrier water and cleaning has also reduced by around 150KL a year, saving our precious resource.

The UV system also has seen a reduction in cleaning requirements. A higher UVT means a better disinfection rate, reducing the risk to effluent quality and the environment. The time required to drain and clean the UV tank has reduced by 50%, large clumps no longer block the drain lines and build up on the UV sleeves has reduced requiring less water to clean. As less abrasive techniques are required for cleaning the UV sleeves, the risk to damaging the sleeves, or the lamps inside is also reduced. Morwell's UV system requires custom built lamps and sleeves which take time to make, so a crack in a sleeve could cost \$1200 just in parts to repair.



Inline filter during weekly inspection

It's a great piece of mind knowing that a small change has made a large impact on the operation of the plant. The specialised final effluent instruments are easier to clean, and are found to be more accurate with small samples line blockages reduced.

From an environmental perspective, this minimises risk to Morwell Wetlands and Morwell River which the plant discharges into.

Suggest improvements, if time or financial limitations were not a factor.

Still continuing to modifying the spray manifold to allow for a better coverage and ease of cleaning. With the filter now installed it might be worth trying finer nozzles to improve the aesthetic appearance of the clarifier. Having a built in automated cleaning system might make it more viable for larger plants.

Any other comments?

This small, yet huge change makes the waste water technician's life much easier and enables them to spend more time on system performance optimisation and other operational activities. The reduced manual effort required for clarifier cleaning is a huge OH&S benefit and a big time saver.

Enhanced Communication for Safety

Sally Munday, Walcha Council



THE PROBLEM

What was the problem that you experienced?

The original issue was communication between workers while using the sewer jetting machine and being able to use both hands for its operation, especially if the jetting machine remote control was not working. Another problem situation was maintaining communications while working in pump wells with pumps running, also to keep hands free. Working around machinery like excavators, backhoes and bobcats while giving directions to operators also posed communication difficulties.

How did the problem impact you or your work situation?

Miscommunication on worksites or through not being able to be in constant contact with each other, had the potential to impact operator safety.

How long had the problem been occurring?

Has been occurring for some time and was more evident following the purchase of a new jetting machine as it is louder than the old one.



THE SOLUTION

How did you come up with the solution?

Having used Bluetooth ear muffs when lawn mowing at home, it was seemed logical that they would be useful at work. Some online investigations were undertaken online to see what was available. Headsets that protected our hearing while allowing operators to communicate through voice activation, therefore no need for press to talk, were what we wanted. Several options were identified and our stores people also found some sets as well.

From there my supervisor and myself studied various options and came up with a set that would suit our needs. The unit chosen also had the extra advantages of radio frequencies that allowed enhanced communication with machinery operators and traffic

Who helped work on the solution?

- Rob Powell - Coordinator water & wastewater
- Debbie Robertson - Relief Store person
- Ron Wicks - Store person

Describe the solution.

Rechargeable 3M Peltor Litecom Plus Headset. Hearing protection with built in two way radio and Bluetooth multipoint technology with hands free voice activated transmission.

How has it helped you at work?

It has increased safety by allowing us to be able to communicate effectively. We have also found more uses than just the original issues identified and the list seems to be increasing the more we use them.

Suggest improvements, if time or financial limitations were not a factor.

If finances would allow, we like to purchase more headsets for our staff and maybe integrate their use into other areas of the council like road construction, mowing and traffic control.

Kremur Street STP – Temporary Inlet Screen

Rob Marshall, Albury City Council

THE PROBLEM

What was the problem that you experienced?

January 2022 was a particularly wet month for Albury. In that one month Albury received three 1 in 100 year rainfall events. Due to the widespread damage the flooding caused, a Natural Disaster declaration was issued. These events caused large rocks and other debris to move through the city's sewer system. When this debris entered the Kremur Street Wastewater Treatment Plant (WWTP) it caused irreparable damage to the single inlet step screen at the treatment plant. The screen plays a crucial role in the protection of downstream assets.

How did the problem impact you or your work situation?

The damaged screen had to be removed from the WWTP's inlet. This impacted downstream processes such as the bioreactors, aeration equipment and our tertiary clarifiers which had a notable increase in rags and debris floating on the surface. Constant monitoring of the WWTP was also required to ensure that critical pumps, mixers and blowers did not foul up with rags. Workloads increased and operators were required to attend site after hours to de-rag critical equipment, to ensure the treatment plant could operate and meet licence requirements.

How long had the problem been occurring?

The WWTP operated for only 4 days with no inlet screening before Council staff put their heads together to come up with the solution of the temporary screen as well as build and install it.



Damage to the existing step screen



THE SOLUTION

How did you come up with the solution?

Albury has a team of exceptional staff that always look for ways to overcome problems and improve our systems. As soon as the damaged screen was identified, the Mechanical team worked tirelessly to design and fabricate a temporary option to minimise detrimental impacts to the Kremur Street WWTP, with the solution installed within 4 days. The problem was to create a screen which could be easily lifted and cleaned manually. The screen also had to have some kind of overflow protection on it, in the event that the manual cleaning could not be completed.

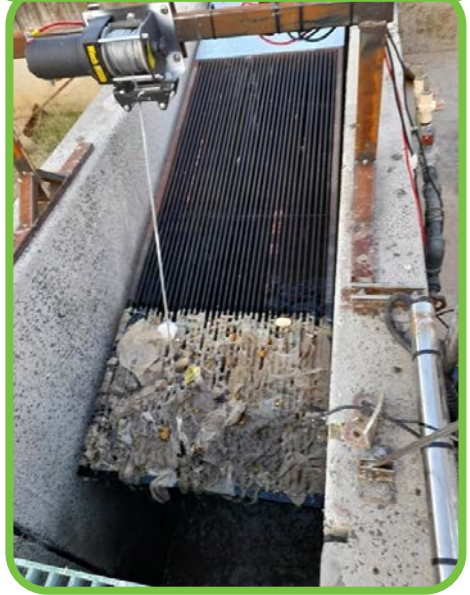
Who helped work on the solution?

The mechanical team at Albury City. The new screen had to be designed and fabricated in a short period of time. The team pulled together to get the job done.

Describe the solution.

The solution was to design, fabricate and install a temporary inlet screen until a permanent screen could be installed. The screen had to be simple to use, safe and easy to lift for daily manual cleaning, allow for high flow bypass in the event of another storm or if the screen blocked due to large amounts of ragging. Most importantly of all, the screen had to operate in a way which allowed for safe manual cleaning by a single operator, as on-call staff were required to attend site after hours to manually clean the screen after the even flow peak.

The new screen being raised for cleaning



The screen was fabricated to size and installed into the inlet channel. A battery operated winch was fitted to the screen. This was used by the operators to raise and lower the screen easily and safely before and after cleaning it. At the opposite end to the winch cable, a pivot point was installed which allowed the screen to pivot from its intended angle of use to horizontal for manual cleaning. The screen had to be cleaned three times a day. Therefore, the cleaning process needed to be simple and easy to complete.

How has it helped you at work?

The temporary screen has allowed the WWTP to continue to operate as normal. The only exception being the manual cleaning three times a day. However, the winch has made manual cleaning a breeze.

Suggest improvements, if time or financial limitations were not a factor.

If time was not an issue it would have been useful to install a washing down system, to make it easier for the operators to remove any built on scum without having to physically clean it.



Preventing broken IFAS media disrupting the operation of a WWTP

Jim Rozaklis, P&T Alliance, Suez Water Australia & New Zealand

THE PROBLEM

What was the problem that you experienced?

Integrated Fixed Film Activated Sludge (IFAS) media is used in two bioreactors at Glenelg WWTP in South Australia to increase the nitrifying capacity of activated sludge. The media is aging and therefore starting to break apart. This has been exacerbated by capital works to replace the diffusers which has resulted in the overloading of media in the basins. The construction of tube screens is also thought to have had an impact. The broken media gets caught in the screen mesh wire that is located at the end of a zone in the tank, preventing the treated wastewater from passing through to the next zone. Some of the broken media also passes through the mesh and enters the next zone where it should not be.



How did the problem impact you or your work situation?

The build-up of the broken media on the screens and in the tank meant that the tanks had to be isolated for partial drain down to be able to inspect and clean the screens and the tanks. This disrupts the treatment process, has the potential to impact the treated water quality and means that I am spending time doing this task instead of something else.

This task was taking more than 6 hours for each tank – including setup to drain the tank and hose the screen blocked with broken media. This task was required approximately every 12 weeks for each tank. With four tanks, it meant one tank was being cleaned each month.

When hosing down the media to remove it from the screens to clear the blockage, we were not taking the broken media out of the tank. Instead, we were just washing it back into the tank where it would continue to be an issue. It was always a short-term remedy.

The task also involved a lot of manual handling with moving heavy hoses around the tanks to hose the screens down and also placing heavy submersible pumps into the tank to partially drain it down. Therefore, the task also posed a safety risk.

How long had the problem been occurring?

The problem has been occurring since approximately June 2020.

THE SOLUTION

How did you come up with the solution?

The current work around was time consuming, ineffective, and posed a health and safety risk. So, options to fix the problem were investigated. The first option trialled was a fishing net to capture the media in the tanks. This turned out to have too many safety hazards due to the heavy nets and was also very labour intensive.

To overcome this, another idea of using a small basket was trialled. However, like the fishing net, it involved manual handling, and was labour intensive.

Trialling these two ideas led to the current solution of drawing the mixed liquor out of the tank and pumping it through a vessel with a strainer in the bottom. The strainer efficiently captures all the media but without the manual handling. Taking the media out of the tank also means that we are reducing the volume of media that keeps building up on the screens.

Who helped work on the solution?

The mechanical and electrical team at Glenelg WWTP also helped with the building of the strainer.

Describe the solution.

A customised strainer was constructed which is an IBC container with a mesh base and an open top. The mixed liquor is pumped into the top of the strainer. The strainer is kept on top of the mixed liquor channel so that we are not wasting any water. The broken pieces of media are captured on the mesh in the strainer and then discarded.

The strainer was made with materials that were already available on site without any extra cost. The container is an empty IBC and the bottom mesh was sourced from the mechanical workshop, which was surplus from another job. A true sustainable solution.



How has it helped you at work?

The strainer captures the broken media which is then discarded instead of being sent back to the tanks. This reduces the frequency of high surcharge levels in the tank and also avoids drain down and cleaning of the tanks and the screens. This solution has:

- removed a manual handling task (safety risk) of cleaning the screens and the tanks
- enabled the staff do more productive tasks with that time
- resulted in reduced interruptions to the treatment process and therefore risk of impacting the treated water quality

Suggest improvements. If time or financial limitations were not a factor.

Currently the temporary pipework and mobile pump is installed each time the system is set up. A more permanent arrangement could be set up such that the pipework is always in place, and we just move the pump and strainer. A further enhancement could be to permanently install the pump and strainer too and this way, we would just start the pump whenever it is required.

Any other comments.

What I have learnt is that the first challenge is to identify that you have a problem. The next challenge is to keep trying and not be too disappointed if your first or second idea does not work as you had hoped. Eventually the right solution will be found, especially with some great teamwork.





WIOA celebrates the sharing of good ideas by publishing all of the 2022 entries for the PASS Award. The authors, WIOA and Aqualift are not responsible for the outcomes of any actions taken on the basis of information in this document, nor for any errors or omissions. The authors, WIOA and Aqualift disclaim all and any liability to any person in respect of anything and the consequences of anything done or omitted to be done by a person in reliance upon the whole or any part of this document.

If further expert advice is required, the services of a professional should be sought.